DATA REPORT on Colorectal Cancer in Massachusetts

The Massachusetts Cancer Registry, Massachusetts Department of Public Health in conjunction with the Harvard Center for Cancer Prevention, Harvard School of Public Health

PURPOSE

The purpose of this report is to provide descriptive data on the incidence of and mortality from colorectal cancer among residents of Massachusetts. This report presents Massachusetts colorectal cancer data by year, age, race/ethnicity, stage, and subsite and compares Massachusetts to the nation. Also, the report presents Massachusetts colorectal cancer screening data. Colorectal cancer is one of the more common types of cancer for both men and women, and can be prevented or detected early through routine screening.

DATA SOURCES

Behavioral Risk Factor Surveillance System (BRFSS):

The data on colorectal cancer screening were collected by the Health Survey Program as part of the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a random-digit-dial telephone survey conducted among residents of Massachusetts 18 years of age and older. The data collected by the BRFSS include health characteristics, risk factors, and preventive behaviors. The Massachusetts screening data presented in this report were weighted and represent estimates for adults in Massachusetts.

Massachusetts Cancer Registry:

The Massachusetts cancer incidence data presented in this report were collected by the Massachusetts Cancer Registry (MCR). The MCR is a population-based cancer registry that began collecting reports of newly diagnosed cancer cases in 1982. In 2001, the MCR collected reports from all Massachusetts acute care hospitals, one medical practice association, and selected physician specialties. In addition, the MCR identified cancers noted on death certificates that were not previously reported to the MCR. The North American Association of Central Cancer Registries (NAACCR) has estimated that MCR case ascertainment is over 95% complete. The Massachusetts cancer cases presented in this report are primary cases of invasive cancer diagnosed among Massachusetts residents, unless noted otherwise.

Surveillance, Epidemiology and End Results (SEER):

The national data on cancer incidence are from the National Cancer Institute's SEER Program, an authoritative source on cancer incidence in the United States that collects and publishes cancer data from registries in selected areas. The national cancer incidence data in this report include malignant cases from 12 SEER areas (including Atlanta, Connecticut, Detroit, Hawaii, Iowa, New Mexico, San Francisco-Oakland, Seattle-Puget Sound, Utah, Los Angeles, San Jose-Monterey, and Alaska). The national and Massachusetts data on cancer mortality were obtained using SEER public-use data provided by the National Center for Health Statistics. The national mortality data include the entire United States.

COLORECTAL CANCER COMPARED WITH OTHER CANCERS

Table 1. Total cases and percentage of all cases for the five most commonly diagnosed cancers, Massachusetts, 1997-2001

Male			Female		
Cancer site	**Cases**	**Percent**	**Cancer site**	**Cases**	**Percent**
Prostate	25,637	30.3	Breast	25,799	30.9
Bronchus & Lung	12,518	14.8	Bronchus & Lung	11,181	13.4
Colon/Rectum	9,820	11.6	Colon/Rectum	10,238	12.3
Urinary Bladder*	6,310	7.5	Corpus Uteri & Uterus, NOS	4,866	5.8
Non-Hodgkin Lymphoma	3,216	3.8	Non-Hodgkin Lymphoma	3,050	3.7
All Sites	84,589	100.0	All Sites	83,482	100.0

* this site includes invasive and *in situ* cancers.
Data source: Massachusetts Cancer Registry, *Cancer Incidence and Mortality in Massachusetts, 1997-2001: Statewide Report*

Table 2. Total cases and percentage of all cases for the five most common causes of cancer death, Massachusetts, 1997-2001

Male			Female		
Cancer site	**Deaths**	**Percent**	**Cancer site**	**Deaths**	**Percent**
Bronchus & Lung	9,951	28.9	Bronchus & Lung	8,412	24.2
Prostate	3,859	11.2	Breast	5,371	15.4
Colon/Rectum	3,708	10.8	Colon/Rectum	4,009	11.5
Pancreas	1,701	4.9	Pancreas	2,061	5.9
Non-Hodgkin Lymphoma	1,390	4.0	Ovary	1,665	4.8
All Sites	34,478	100.0	All Sites	34,766	100.0

Data source: Massachusetts Cancer Registry, *Cancer Incidence and Mortality in Massachusetts, 1997-2001: Statewide Report*

New cases

- In the five year period between 1997 and 2001, 84,589 men and 83,482 women in Massachusetts were diagnosed with cancer. Of those, 9,820 men and 10,238 women were diagnosed with colorectal cancer (an average of about 4,000 total cases of colorectal cancer per year in Massachusetts).
- Colorectal cancer was the third most common cancer diagnosis in men (after cancer of the prostate and bronchus and lung), and the third most common cancer diagnosis in women (after cancer of the breast and bronchus and lung).
- 12% of all cancers occurring among Massachusetts men between 1997 and 2001 and 12% of all cancers occurring among Massachusetts women during the same time period were colorectal cancers.

Deaths

- Colorectal cancer was the third leading cause of cancer death for both men and women in Massachusetts between 1997 and 2001.

COLORECTAL CANCER IN MASSACHUSETTS AND NATIONALLY

Table 3. Age-adjusted rates (per 100,000) of colorectal cancer, Massachusetts and nationally, 1997-2001

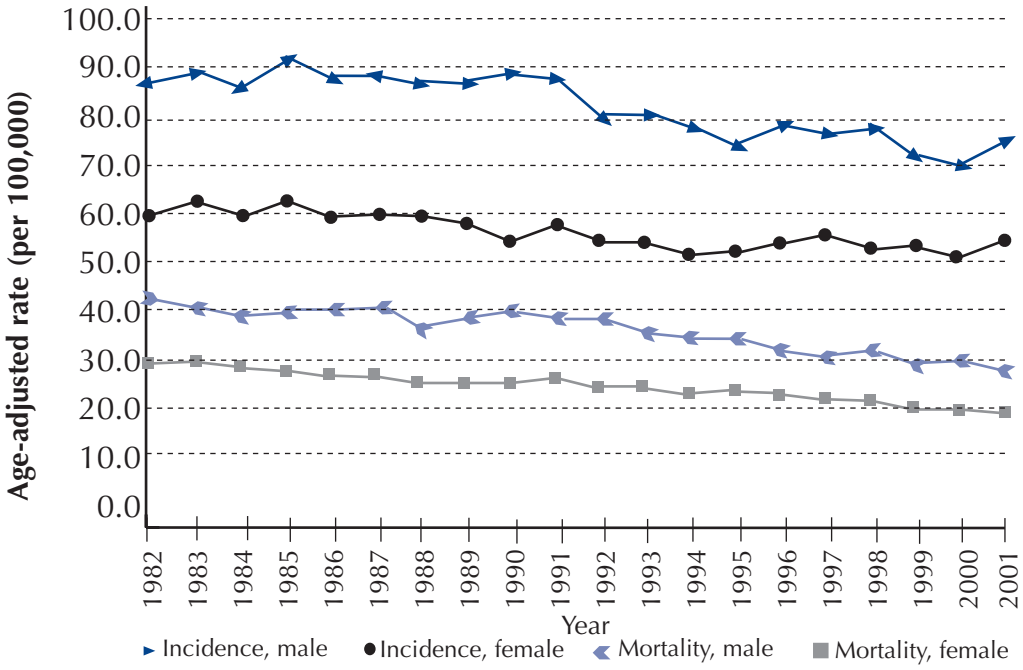
	Male		Female	
	Incidence	**Mortality**	**Incidence**	**Mortality**
Massachusetts	73.1	28.5	51.9	18.9
SEER areas/ United States	63.4	25.3	46.4	17.7

Data sources: Massachusetts Cancer Registry and Surveillance, Epidemiology and End Results

- The age-adjusted incidence rate of invasive colorectal cancer was about 1.4 times higher among Massachusetts men than among women (73.1 and 51.9 cases per 100,000 respectively during 1997-2001).
- Likewise, the age-adjusted mortality rate of colorectal cancer was about 1.5 times higher among Massachusetts men than among women.
- During 1997-2001, for both men and women, the incidence rate of colorectal cancer was significantly higher in Massachusetts than in the SEER areas, and the mortality rate of colorectal cancer was significantly higher in Massachusetts than in the United States.

COLORECTAL CANCER TRENDS

Figure 1. Trends in the incidence and mortality of colorectal cancer, Massachusetts, 1982-2001



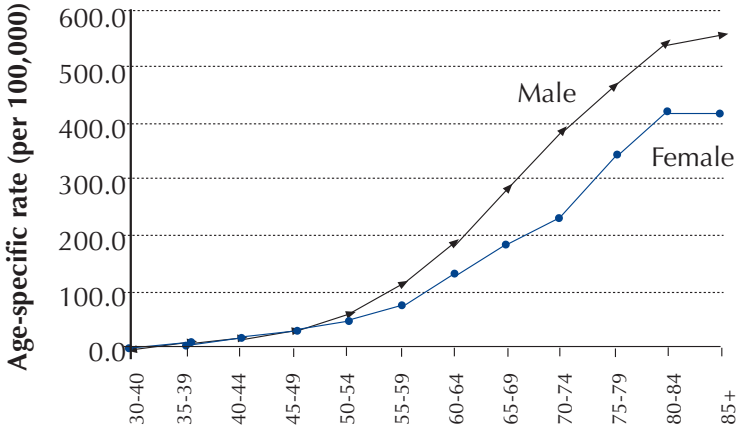
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Incidence, male	86.0	87.7	85.3	90.5	86.9	87.5	85.7	85.7	87.7	86.6	79.5	79.2	76.8	72.7	77.1	75.4	76.7	70.9	68.8	73.7
Incidence, female	58.6	61.2	58.3	60.8	58.1	57.6	58.2	56.0	53.1	56.0	53.0	52.4	50.4	50.9	52.5	53.9	51.3	51.5	49.4	53.3
Mortality, male	41.6	39.6	38.2	38.7	39.2	39.7	36.1	37.9	38.5	37.0	37.1	34.2	33.2	33.2	30.7	29.2	30.6	27.7	28.6	26.7
Mortality, female	27.7	28.4	26.9	26.4	25.6	25.6	23.8	23.2	23.3	25.2	23.0	23.1	21.6	22.4	21.3	20.5	19.9	18.8	17.9	17.5

Data sources: Massachusetts Cancer Registry and Surveillance, Epidemiology and End Results

- The incidence rate of invasive colorectal cancer was higher among Massachusetts men than among Massachusetts women for the entire period from 1982 to 2001. The same was true of the mortality rate.
- From 1982 to 2001, the incidence rate of colorectal cancer decreased for both men and women. For men, the rate decreased by 1.3% per year over this time period. For women the rate decreased by 1.0% per year. These decreases were statistically significant.
- The mortality rate of colorectal cancer also decreased. For men, it decreased by 0.9% per year from 1982 to 1991 and by 3.2% per year from 1991 to 2001. For women, the mortality rate of colorectal cancer decreased by 1.9% per year from 1982 to 1996 and by 4.1% per year from 1996 to 2001. These decreases were also statistically significant.

PATTERNS IN COLORECTAL CANCER INCIDENCE BY AGE

Figure 2. Age-specific incidence rates of colorectal cancer, Massachusetts, 1997-2001



	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Male	4.4	7.1	14.0	27.9	57.2	111.9	180.8	281.3	383.9	470.1	541.3	557.9
Female	2.9	6.1	14.0	24.0	45.8	74.3	126.2	179.4	233.9	339.8	417.7	421.6

Data source: Massachusetts Cancer Registry

- The incidence of colorectal cancer increased with age for both Massachusetts men and women during 1997-2001. The increases were largest after age 50.
- During this time period, the highest age-specific incidence rate for men was 557.9 cases per 100,000 for men 85 and older and for women was 421.6 cases per 100,000 for women 85 and older.
- From 1997-2001, there were 61 cases of invasive colorectal cancer among Massachusetts men and women less than age 30. Because of the small number of cases, these data are not presented here.
- Rates were only calculated when the number of cases in a particular age group was at least 20.

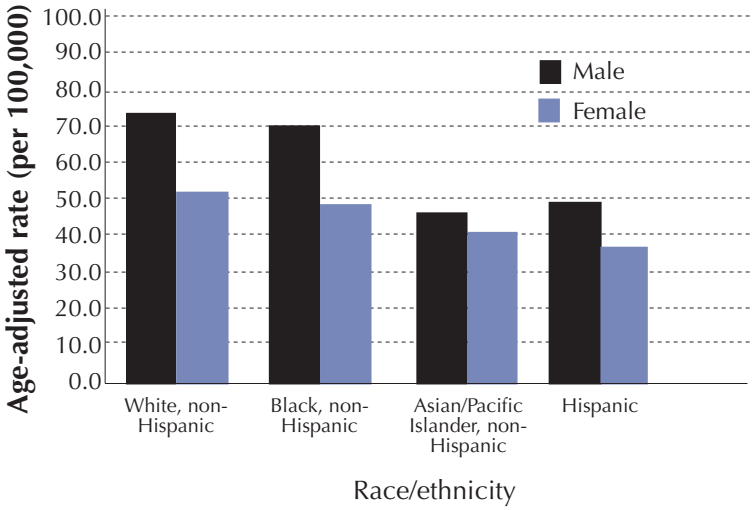
PATTERNS IN COLORECTAL CANCER INCIDENCE BY RACE/ETHNICITY

Figure 3. Age-adjusted incidence rates of colorectal cancer by race/ethnicity, Massachusetts, 1997-2001

Race/ethnicity

	White, non-Hispanic	Black, non-Hispanic	Asian/Pacific Islander, non-Hispanic	Hispanic
Male	72.9	71.2	45.7	48.1
Female	51.5	47.9	40.5	36.0

Data source: Massachusetts Cancer Registry



- The age-adjusted incidence rate of invasive colorectal cancer from 1997-2001 was 1.6 times greater among white, non-Hispanic men than among Asian/Pacific Islander, non-Hispanic men and 1.4 times greater among white, non-Hispanic women than among Hispanic women.

- From 1997-2001, among Massachusetts men, the incidence rate of colorectal cancer was similar among white, non-Hispanics and black, non-Hispanics and significantly lower among Asian/Pacific Islander, non-Hispanics and Hispanics.

- Among Massachusetts women during this time period, the incidence rate of colorectal cancer was similar among white, non-Hispanics and black, non-Hispanics. The incidence rate of colorectal cancer among Asian/Pacific Islander, non-Hispanics and among Hispanics was significantly lower than the incidence rate among white, non-Hispanic women.

PATTERNS OF COLORECTAL CANCER BY STAGE AT DIAGNOSIS

Table 4. Percentage distribution among colorectal cancer cases by stage at diagnosis*, Massachusetts

Stage at diagnosis	1995	1998	2001
***In situ*†** (limited to starting point)	7.8%	9.2%	5.4%
Localized (confined to organ where it began)	27.2%	27.5%	35.9%
Total early stage (*in situ* and localized)	35.0%	36.7%	41.3%
Regional (spread to some nearby areas)	42.8%	40.8%	37.5%
Distant (spread into other parts of the body)	16.7%	15.6%	15.4%
Total late stage (regional and distant)	59.5%	56.4%	52.9%
Unstaged (a stage is not assigned)	5.6%	6.9%	5.9%

* Based on SEER summary staging.
† *In situ* colorectal cases are only included in this stage at diagnosis analysis.
Data source: Massachusetts Cancer Registry

- A small percentage of colorectal cancer cases in Massachusetts was diagnosed at the *in situ* stage (5.4% in 2001).

- The majority of cases of colorectal cancer were diagnosed at a late stage (either regional or distant).

- The percentage of cases of colorectal cancer diagnosed at an early stage in Massachusetts has increased from 35.0% in 1995 to 41.3% in 2001. Likewise, the percentage of cases diagnosed at a late stage has decreased from 59.5% in 1995 to 52.9% in 2001.

PATTERNS IN COLORECTAL CANCER INCIDENCE BY ANATOMICAL SUBSITE

Table 5. Percentage and rate of colorectal cancer cases by bowel segment, sex, race/ethnicity, and age, Massachusetts, 1997-2001

	Left bowel*		Right bowel*	
	Percent of row	Age-adjusted rate†	Percent of row	Age-adjusted rate†
Sex				
Male	61.6%	42.2	38.4%	27.1
Female	51.5%	25.9	48.5%	23.0
Race/ethnicity				
White, non-Hispanic	56.3%	32.7	43.7%	24.6
Black, non-Hispanic	55.1%	28.9	44.9%	24.1
Asian/Pacific Islander, non-Hispanic	68.7%	28.1	31.3%	13.6
Hispanic	63.8%	23.1	36.2%	15.0
	Left bowel*		**Right bowel***	
	Percent of row	Age-specific rate†	Percent of row	Age-specific rate†
Age group (years)				
0-39	70.1%	1.2	29.9%	0.5
40-49	69.7%	13.1	30.3%	5.7
50-59	67.9%	45.1	32.2%	21.4
60-69	62.0%	112.2	38.0%	68.7
70-79	54.5%	177.6	45.5%	148.5
80 +	46.2%	192.4	53.8%	223.7

* Left bowel includes codes C18.6-C18.7, C19.9, C20.9. Right bowel includes codes C18.0-C18.5. C18.8 (overlapping segments), C18.9 (colon, NOS), and C26.0 (intestinal tract, NOS) are not included in this analysis.
† per 100,000
Data source: Massachusetts Cancer Registry

- In this analysis, the colon is divided between the splenic flexure and the descending colon into the left bowel and right bowel. Flexible sigmoidoscopy, one option of screening for colorectal cancer, only examines the left bowel. Colonoscopy, another option for screening for colorectal cancer, examines both the right and left bowel.

- The percentage of cases and the age-adjusted incidence rate of invasive left bowel cancer were higher than right bowel cancer for both men and women in Massachusetts during 1997-2001. However, while the rate was similar between left and right bowel for women, the rate of left bowel cancer was 1.5 times the rate of right bowel cancer for men.

- All race/ethnicities had a higher percentage and age-adjusted incidence rate of left bowel cancer than right bowel cancer. Asian/Pacific Islander, non-Hispanics had over two times the rate of left bowel cancer compared with right bowel cancer during 1997-2001.

- Left bowel cancer was more common among all age groups except 80 and older in Massachusetts. Right bowel cancer was more common among those 80 and older (54%).

COLORECTAL CANCER SCREENING

- In 2001, 39.9% of Massachusetts men and 37.4% of Massachusetts women age 50 and older had a blood stool test in the past two years. Similarly, 47.8% of Massachusetts men and 42.1% of Massachusetts women age 50 and older had a sigmoidoscopy or colonoscopy in the past 5 years.
- The age-adjusted percentage of Massachusetts adults age 50 and older who had a sigmoidoscopy or colonoscopy screening for colorectal cancer in the past five years increased from 27% in 1993 to 45% in 2001.
- In 2001, the age-adjusted percentage of Massachusetts adults age 50 and older who had a sigmoidoscopy or colonoscopy in the past 5 years was 45.3% for white, non-Hispanics, 43.9% for black, non-Hispanics, and 33.6% for Hispanics. The numbers among Asian, non-Hispanics were insufficient to calculate a percentage.

DATA SUMMARY

- Colorectal cancer was the third leading cause of new cancer cases and cancer deaths for both men and women in Massachusetts during 1997-2001.
- The incidence and mortality rates of colorectal cancer were higher in men than in women and higher in Massachusetts than in the United States during 1997-2001.
- Over the past two decades, the incidence and mortality rates of colorectal cancer in Massachusetts have decreased.
- From 1997-2001, the incidence rate of colorectal cancer in Massachusetts increased with age, particularly after age 50.
- There were some variations in the incidence of colorectal cancer by race/ethnicity in Massachusetts during this time period.
- Although the majority of colorectal cancers in Massachusetts were diagnosed at a late stage, the percentage that was diagnosed at a late stage has decreased from 1995 to 2001. Still, less than 10% of colorectal cancers in Massachusetts were diagnosed at the *in situ* stage during this time period.
- In Massachusetts during 1997-2001, the incidence rate of left bowel cancer was higher than the incidence rate of right bowel cancer among men, women, all race/ethnicities, and all age groups less than 80.
- While the percentage of Massachusetts adults age 50 and older who had a sigmoidoscopy or colonoscopy screening for colorectal cancer in the past five years increased in the past several years, the percentage in 2001 was still less than 50%.

DISCUSSION AND IMPLICATIONS FOR PREVENTION

As detailed in this report, colorectal cancer is one of the most common cancers diagnosed in Massachusetts, and it is a leading cause of cancer-related deaths.

- Although colorectal cancer rates have declined steadily in Massachusetts (in terms of both disease and death) over the past 20 years, the rates remain significantly higher in Massachusetts than in the rest of the nation.
- Colorectal cancer becomes more common as people age. The increases in frequency are largest after age 50, supporting the recommendations that screening start at that age.
- Many people still consider colorectal cancer a man's disease; however, the data do not support this theory. In fact, in Massachusetts colorectal cancer strikes and kills more women than men.
- Colorectal cancer affects all ethnic groups in Massachusetts, but the disease is most common among white and black, non-Hispanics (as compared to Hispanics and Asians).

There are proven ways to reduce the incidence and mortality of this common and often-fatal disease. The majority of colorectal cancers could be prevented through lifestyle changes and widespread screening. Recommendations include:

- Be physically active for at least 30 minutes per day.
- Maintain a healthy weight.
- Take a multivitamin with folate every day.
- If you drink, limit alcohol to less than one drink per day for women or less than two drinks per day for men.
- Limit red meat to no more than two servings per week.
- Eat five or more servings of fruits and vegetables a day.
- Don't smoke.
- Eat foods containing calcium or take a calcium supplement every day.
- Starting regular colorectal cancer screening at age 50. Individuals with particular risks or concerns, such as those with a family history of polyps or colorectal cancer or those who have inflammatory bowel disease, may need to start colorectal cancer screening at a younger age.

Screening is a major element in the fight against colorectal cancer. Screening tests can detect early abnormalities, allowing for treatment before cancer has a chance to develop. If cancer is already present, screening tests can aid in early diagnosis. This is extremely important because colorectal cancer is highly curable if it is found and treated early. There is a 90% chance of survival five years beyond diagnosis if a patient is diagnosed at the earliest, most treatable stage. However, this survival rate drops to less than 10 percent for those diagnosed with advanced disease. Most people in Massachusetts who have colorectal cancer are not being diagnosed early enough to gain this survival advantage. In fact, more than half do not have their cancer diagnosed until after it has spread beyond the colon or rectum.

Widespread screening is key to increasing prevention and early detection of colorectal cancer. There are five recommended screening strategies:

- Home fecal occult blood test (every year)
- Flexible sigmoidoscopy (every 5 years)
- Home fecal occult blood test (every year) and flexible

sigmoidoscopy (every 5 years)
- Double-contrast barium enema (every 5-10 years)
- Colonoscopy (every 10 years)

Because there is no proven benefit of one method over the others, the choice of screening strategy should be based on patient /provider preference and access to resources. The costs of individual tests differ; however, taking into account the costs of repeat testing and follow-up, all five strategies are considered cost-effective. In addition, Medicare and many other insurers now cover the costs of colorectal cancer screening.

In summary, while colorectal cancer can cause enormous suffering and burdensome increases in health care costs, this disease is highly preventable. To reduce the burden of colorectal cancer, we must implement individual, community, and statewide interventions to promote healthy lifestyles and increase screening rates in Massachusetts.

TECHNICAL NOTES AND DEFINITIONS

Age-adjusted rate – a rate that takes into account the age structure of an area, allowing for the comparison of areas with different age distributions. Age-adjusted rates were calculated by weighting the age-specific rates for a given year by the age distribution of the 2000 U.S. standard population. The weighted age-specific rates were then added to produce the adjusted rate for all ages combined. Rates should only be compared if they have been adjusted to the same standard population.

Age-adjusted percentage – similar to an age-adjusted rate, a percentage that takes into account the age structure of a group, allowing for the comparison of groups with different age distributions. Age-adjusted percentages were calculated by weighting the age-specific percentages by a standard set of weights and then computing a weighted average percentage. See *A Profile of Health Among Massachusetts Adults, 2001: Results from the Behavioral Risk Factor Surveillance System* for more information.

Age-specific rate – a rate among people of a particular age range in a given time period. Age-specific rates were calculated by dividing the number of people in an age group who were newly diagnosed with cancer (incidence) or died of cancer (mortality) by the number of people in that same age group overall.

Incidence – the number of people who are newly diagnosed with a disease, condition, or illness during a particular time period. The incidence data presented here were coded using the International Classification of Disease for Oncology (ICD-O) coding system. Colorectal cancer cases were defined with ICD-O-3 codes of C18.0-C18.9, C19.9, C20.9, and C26.0 with the exception of histologies 9590-9989 (or equivalent for older data).

Mortality – the number of people who died of a disease, condition, or illness during a particular time period. The mortality data presented here were coded using the International Classification of Diseases (ICD). Death reports from 1982 -1998 were coded using the ninth edition (ICD-9), and death reports from 1999-2001 were coded using the tenth edition (ICD-10). However, the number of deaths due to colorectal cancer was stable across the two revisions of ICD. Colorectal cancer was defined as 153, 154.0-154.1, 159.0 (ICD-9) and C18-C20, C26.0 (ICD-10).

Population estimates – rates were calculated using population estimates obtained from the Massachusetts Department of Public Health (MDPH) using the Massachusetts Community Health Information Profile (MassCHIP) demographic/census files.

Race/ethnicity – categories presented in this report are mutually exclusive. Cases and deaths are only included in one race/ethnicity category.

Statistical significance – an estimate of the probability that the trend or difference between groups is due to chance alone. In this report, the trend or difference between groups was considered statistically significant when the p value was less than or equal to 0.05.

Trend – the trend data were analyzed using the Joinpoint Regression Program from the National Cancer Institute. This program identifies joined line segments which are connected by points where the trend changes. An annual percent change is calculated for each line segment. The annual percent change describes the average change per year over the line segment. A positive annual percent change corresponds to an increasing trend and a negative annual percent change corresponds to a decreasing trend.

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